Historic Buildings and Rehabilitation Expenditures: A Panel Data Approach

Authors

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Abstract

Using a panel data set, a hedonic model is estimated to determine the characteristics of buildings that have influenced the market value assessments of a set of historic and non-historically designated buildings. Holding constant the characteristics of buildings, the findings indicate higher assessed values for some classes of historic buildings. Furthermore, using a two-stage Heckman sample selection model, the findings show that the expenditures on renovations contribute significantly to the change in assessed values of buildings, although less than might be expected. These and other results may be helpful in the design of cost effective rehabilitation strategies for historic preservation.

The issue of the rehabilitation of historic buildings has attracted considerable attention from policymakers in the United States and Canada.[1] Supporters of historic building preservation claim that apart from the direct benefit of improving the building stock, there are secondary benefits related to increased tourism, employment, energy savings, and waste reduction.[2] While the secondary benefits are undoubtedly important, often an important element of the discussion is the issue of the expected gains in assessed values and hence property taxes that may result from the granting of assistance.

This paper reports on some background research on this issue by examining the types of buildings that have been rehabilitated, and the effectiveness of those expenditures in influencing the assessed values. Using a unique panel data set, the research uncovers the factors that have affected the market value assessments of both historic and non-historic buildings in the Exchange District of Winnipeg, Manitoba, Canada. The area contains one of the largest collections of turn-of-the-century buildings available for rehabilitation and reuse. The area was chosen because it corresponds to the area that has been targeted for municipal tax credits.

There are a number of advantages that result from using a panel data set for the examination of the effect of historic designation on renovation and building values. First, is the ability to track changes both in designation and renovation over time for a set of historic and non-historic buildings. Second, an important advantage

of the panel data used in this study is that it allows one to overcome a major problem involving hedonic models of building values, which is making sure that all economically relevant building characteristics are included. Third, the data set that is employed includes information on a set of non-historically designated buildings in the same area, which means the model has the potential to isolate the effect of historic designation on assessed values.

A number of empirical questions are addressed. First, how does historic designation influence the assessed value of historic buildings? Second, what is the effect of a number of key characteristics of buildings on the assessed values of buildings in the area? Third, is there a local externality from the presence of historic buildings on the assessed values of nearby historic and non-historic buildings? Fourth, is there a difference between the effectiveness of expenditures on rehabilitation for historic versus non-historic buildings? Finally, is there a difference in the characteristics of buildings that were rehabilitated versus those that were not?

To address these questions, a hedonic model is developed to estimate the factors that influence the market value assessments of these buildings. Using a three-period panel data set, two models are developed to uncover these effects. The first model is designed to uncover the factors that determine the assessed values of both historic and non-historic buildings over the period. The findings indicate that, controlling for a number of key characteristics of buildings, the assessed value of a building is higher for some classes of historic buildings. For other classes, historic designation has no statistically significant effect on the assessed values of buildings.

The second model is a two-stage Heckman sample selection model. The first stage is used to determine the factors that influence the probability of renovation of the respective buildings. The findings reveal that some classes of historic buildings are more likely to be renovated, controlling for a number of building characteristics. In the second stage, factors are uncovered that determine the *change* in assessed value of the buildings in the sample. Among a number of results, the expenditures on renovations contribute significantly to the change in assessed values of buildings, although less than might be expected. A rationale for this result is provided, along with a discussion of the factors that influence the probability of renovation, as well as the change in assessed values.

The answer to these questions can provide policymakers with some useful input into the design of particular rehabilitation strategies for historic buildings, which may include tax credits, tax abatements, grants, or loans. For example, a forecasting model can be constructed to enable city officials to determine the type of buildings that are likely to require fiscal incentives and the type of buildings that have a lesser need for tax relief. Second, for those municipalities using market value assessment, the results obtained here may provide some insight regarding the property tax revenues they might expect should they decide to offer tax relief. Third, the results can provide some evidence of whether the rehabilitation of

historic buildings is more difficult, in terms of the resulting market value assessment, than the rehabilitation of other buildings. One possibility is that the designation results in higher costs of rehabilitation and hence smaller increases in assessed market values per dollar of expenditure. Finally, once information on the market transactions of the respective buildings is obtained, it will be possible to judge the accuracy of the market value assessments.

This paper is organized as follows. A short background on the literature related to the present study is given. Next there is a discussion of the data set that will be used in the analysis, followed by a brief discussion of the policies used by the City of Winnipeg to preserve historic buildings. A hedonic model is estimated in order to determine the factors that have influenced the market value assessments of the set of buildings in the sample over the past twelve years. The results from the sample selection model are then discussed. The paper closes with concluding remarks.

Historic Designation and Property Values

The literature on historic designation involves a number of different research areas and research questions.[3] More directly related to the issue addressed in this paper, are a number of papers that examine the effect of historic designation on property values. The literature discusses two possible effects of historic designation on property values. The first suggests that historic designation may confer externalities on surrounding properties if the designation results in enhanced building maintenance and improvement. For example, Coulson and Leichenko (2001) examine the effect of historic designation on a cross-section of the appraised values of *residential* properties in Abilene, Texas. In contrast to previous studies, Coulson and Leichenko assess the effect of historic designation on individual properties rather than the effect of historic designation by district. They find net internal and external benefits from historic designation of individual properties. Specifically, they find historic designation results in higher property tax revenues for the City of Abilene than the costs of the property tax incentives provided for historic reinvestment.[4]

The second possible effect is that the historic designation may result in a decline in the sales price of designated properties due to limitations on the property rights of owners as a result of historic designation. Asabere and Huffman (1994a) examine the effect of Philadelphia's historic preservation policies on the sales price of small historic apartment buildings and find a 24% reduction in price compared to non-locally certified properties.[5] They conclude that the way local historic designation as practiced in Philadelphia, which combines a strong regulatory framework with limited incentives, can result in lower property values.

In contrast to Li and Brown (1980), Asabere and Huffman (1994a,b), and Coulson and Leichenko (2001), the empirical work discussed in this paper is based on a panel data set. Similarly to Coulson and Leichenko (2001), this research examines

the effect of historic designation on assessed values as it relates to property tax revenues for municipalities. However, in contrast to Coulson and Leichenko (2001), who examine the effect of historic designation on *residential* properties, the data set covers historic and non-historic *commercial* buildings. In addition, the buildings in the sample are more varied than the buildings used in Asabere and Huffman (1994b), hopefully allowing a more general analysis of the role of historic designation on building values.

The Data Set

It is useful to provide a short history of the City of Winnipeg in order to provide some context for the data sample that was collected. The City of Winnipeg, Manitoba, incorporated in 1874, developed out of a collection of fur trading posts and forts and settlers' cabins near the forks of the Red and Assiniboine Rivers. Winnipeg served as ''The Gateway to the West'' in Canada during the major immigration booms of the 1890s and the first decade of the 1900s and developed major entrepôt functions. At the time, prior to the building of the Panama Canal, Winnipeg was seen as a major component of the transcontinental rail bridge from the Pacific to the Atlantic. These circumstances led to a development boom, which in turn led to the construction of a large number of ''modern'' warehouses, industrial, and office buildings during the late 1800s and early 1900s, which were designed by prominent architects to advanced standards for the period.[6] The end of the prairie settlement policy and the opening of the Panama Canal ended the development boom, which reduced development pressures in Winnipeg leaving a large stock of heritage buildings. Collectively, they are considered as one of the largest and finest collections of turn-of the-century buildings in North America and were designated as a National Historic Site by the Government of Canada in 1999.[7]

In order to assist in their preservation, the City of Winnipeg adopted a series of recommendations designed to conserve and utilize the heritage buildings.[8] As background research, panel data was collected on buildings in the area that were to be included in a municipal property tax credit program.[9] The panel data was collected on a set of historically designated buildings and a set of non-historically designated buildings in the downtown area of Winnipeg.[10]

In general, there are two pieces of legislation that govern the preservation of historic buildings in Winnipeg: the Historical Buildings By-Law and the Downtown Winnipeg Zoning By-Law, ''Historic Design Review.''[11] Under the former, any person wishing to undertake alterations to a building on the Building Conservation List must apply for a ''Certificate of Suitability,'' which ensures that alterations are sympathetic to the original character of the building.[12] Under the latter, all development applications in the Exchange District must be approved by the Downtown Design Board, which bases its decisions on recommendations made by the Historical Buildings Committee.

A review of the City's Historical Buildings Inventory List (revised August 26, 1998) showed 1,011 entries city-wide; of those, 301 were within the confines of the downtown area. It is important to note that buildings that are on the Inventory List may or may not be on the Building Conservation List. A building listed on the Conservation List cannot be demolished, while buildings included on the Historical Buildings Inventory are viewed as possible candidates for inclusion on the Building Conservation List.[13]

There are two methods by which a building may be included on the Building Conservation List under the City of Winnipeg's Historical Buildings By-Law 1474/77; Listing by City Council or Listing by the Chief Administrative Officer. Under both methods, owners are notified of the proposed listing, afforded an opportunity to object by delivering a letter to the City Clerk. If no objection is received within fourteen days of the notification, the building is considered listed by Council. Under the By-Law, the Historical Buildings Committee may also undertake an evaluation of the heritage significance of a structure based on a request by an owner or other party. If the committee decides that listing is warranted, the building is assigned a priority grade, which indicates the degree of alteration that may be considered acceptable.[14] It is important to note the an owner of the Chief Administrative Officer may apply to the City Clerk to have a structure removed from the Building Conversation List, or to have it listed under a different grade. The procedure is similar to that involved in listing the building.[15] In considering a proposed delisting or change of grade, the Policy Committee on Property and Development and City Council of Winnipeg may take into account the economic viability of the building.[16]

The classifications of historic buildings used by the City of Winnipeg can be described as follows. Grade I historical buildings are considered outstanding examples of architectural and historical merit that are designed to be preserved in perpetuity. The only types of work permitted are restoration and maintenance of the entire interior and exterior of these structures. In general, alterations, deletions, and additions to these buildings are considered unacceptable. Grade II buildings comprise the majority of the City of Winnipeg's heritage stock. Alterations that are sympathetic to the character of the building and additions to the exterior are allowed to maintain the economic viability of the structure. In certain cases, adaptive re-use of listed interior elements may be permitted. Grade III buildings have been identified as ''moderately significant heritage examples worthy of listing.''[17] Alterations to the exterior may be permitted, with usually no restriction on the design of interior alterations.

In general, the process involved in removing the designation and/or demolition of the building varies by the Grade of the building. For Grade I buildings, it is very difficult if not impossible to get the designation removed and/or the building demolished. For Grade II buildings, it is quite difficult but not impossible to get the designation removed; however, it is still very difficult for owners to get

permission to demolish the building. For Grade III buildings, it is easier to remove the designation but any request for demolition is still subject to review.[18]

The buildings in the sample were chosen as follows. For the historic buildings, the properties selected were those that would be eligible for the Heritage Building Tax Credit Program (HBTCP). The program includes both a Downtown Heritage Building Tax Credit Program and a credit that applies on a city-wide basis.[19] Only buildings located downtown (i.e., in the geographic area defined by the City of Winnipeg Bylaw 4800/88) are eligible for both programs.[20] Of the 301 buildings in the downtown area, a review of Winnipeg's Building Conservation List (as of September 30, 1998) showed 195 structures possessing the Heritage Status necessary for applying for assistance under the Heritage Building Tax Credit Program (HBTCP) implemented by the Winnipeg City Council in March 1998. A total of 112 of the 195 buildings on the Conservation List or 57% of the total were located downtown. These represent the population of structures potentially eligible for both City Tax Credit Programs. Of the 112 structures listed, a number were dropped from consideration because of civic tax exemptions, full or partial. Included in this category were a number of buildings that were unlikely to have alternative uses such as churches, schools, museums, or specific cultural facilities.[21] In such cases, a tax credit would be either irrelevant or politically difficult to secure on top of the existing level of civic support.[22] In addition, a number of buildings that were city-owned and unoccupied were also excluded from the sample.[23]

It has been estimated that there are approximately 10% Grade I, 30 % Grade II, and 60% Grade III buildings in the population of buildings in the area covered by the sample. The original data set included 3 Grade I, 35 Grade II, and 46 Grade III buildings (84 in total) as of 1998; 3 Grade I, 28 Grade II, and 40 Grade III (71 in total) as of 1994; and 2 Grade I, 28 Grade II, and 39 Grade III buildings (69 in total) as of 1990.[24] Given the small number of Grade I buildings, there is a concern that the effect of historic designation on the assessed values of buildings might be overly sensitive to a particular building rather than the entire grade of buildings.[25] To avoid this problem, the Grade I buildings have been combined with the set of Grade II buildings. Overall, then Grade I and III buildings are under represented in the sample, while Grade II buildings are slightly over represented. Of the 112 properties, the final sample includes panel data on 84 historically designated buildings in the area as of 1998.

In terms of the control group, there are approximately 658 non historically designated buildings in the area that were eligible for the HBTCP program; that is, central Winnipeg.[26] The set of control buildings in the sample includes 48 buildings from this population: with 40 drawn randomly from the population and 8 selected based on data availability.[27] The latter group were judged to be representative of the types of non-historic buildings in the area.

The assessment practice of the City of Winnipeg, which yields the assessment data for the study, is as follows. In determining the tax liabilities of building

owners in 1998, the City of Winnipeg assessors use a lagged assessment procedure in determining market value assessments, which are based on a reference year. The reason is that the assessors use information on the net operating income as reported by building owners as an input into their estimate of the market value of the building. These reports are mandatory and are submitted in a previous reference year. For example, the 1998 tax liability is based on 1995 market values (which are based on net operating income), as well as building characteristics and general economic conditions existing at the time. In addition, assessors take into account expenditures on improvements in the prior period in adjusting this figure.[28] Thus, the 1998 tax bill is an estimate of 1995 market value adjusted for the improvements made to the building in the prior period. The 1998 tax bill is not a current market year assessment.[29] In determining assessed values, the City of Winnipeg is obliged to assess property at ''value,'' which is defined in the Municipal Assessment Act S.M. 1989-90. In the definition, ''value'' means the amount that the property might reasonably be expected to realize if sold in the open market in the applicable reference year by a willing seller to a willing buyer.

The subjective estimate of the market values by assessors, would, in principle, be comparable to the accuracy of the subjective estimates of homeowners used in other studies, or in the case here, the building owners in the sample.[30] One reason is that the estimates of building values may be appealed by the building owners. All assessed values used in the data set are post appeal.[31] A second reason is that the lagged assessment process, as well as the lag in years, means that assessors cannot simply apply an adjustment factor to the previous annual assessment. The fact that building values would change in the four-year period means that market value assessment would require a complete appraisal of the buildings. In addition, the differentiation of the buildings in the area implies that individual market assessment is appropriate and necessary.[32]

Given this assessment practice, data was then obtained on the buildings in the sample for the assessment years 1998, 1994, and 1990 with the existing heritage designations recorded. Given the lagged nature of the assessment procedure, the 1998 assessed values are based on the building characteristics from the 1995 assessment period; the assessed values in 1994 are based on building characteristics from the 1990 assessment period; and the 1990 assessed values are based on the building characteristics from the 1987 assessment period.

Exhibit 1 includes the assessed values on the set of historic and non-historic groups of buildings collected for the assessment years, 1990, 1994, and 1998. The summary statistics reveal a number of systematic differences between the two groups. First, there are relatively more historic buildings in the sample; as of 1998, there were 81 historic and 48 non-historic buildings, respectively. Second, the mean assessed value is significantly higher for the non-historic set of buildings for all assessment years. The assessed values are also higher on a per-square-foot basis, which has been calculated for 1998. Third, the standard deviation in assessed values is higher for the non-historic group of buildings than for the

Exhibit 1 | Market Value Assessments (in dollars)

	Mean	Median	Minimum	Maximum	Std. Dev.	No. of Buildings
Historic						
1990	1,017,008	431,100	33,000	10,844,000	1,829,408	69
1994	876,634	341,500	35,000	10,800,000	1,540,152	71
1998	651,908	256,500	12,110	10,355,200	1,244,123	84
(Per Sq. ft.)	13.67	11.24	1.98	47.31	10.35	84
Non-Historic						
1990	3,273,901	937,000	20,900	18,422,000	4,942,523	63
1994	3,127,840	880,000	27,500	14,602,000	4,498,505	61
1998	2,715,616	715,500	28,100	17,715,000	4,144,718	48
(Per Sq. ft)	29.01	20.51	3.26	256.61	37.11	48
Combined						
1990	2,094,162	471,000	20,900	18,422,000	3,818,284	132
1994	1,916,964	533,000	27,500	14,602,000	3,435,913	132
1998	1,402,347	412,250	12,110	17,715,000	2,852,559	132
(Per Sq. ft)	19.25	15.09	1.98	256.61	24.84	132

Notes: Historic refers to historic building sample. Non-historic refers to the control group sample.

historic buildings. As can be seen, there has been a significant change in the mean assessed value for both the historic and non-historic buildings over the past eight years. For the historic sample of buildings, the respective changes in the mean assessed value were for −16% for the period 1990–1994 and −34% for 1994–1998, while for the non-historic set of buildings, the respective changes were −4.6% for the period 1990–1994 and −15% for 1994–1998.

Exhibit 1 also summarizes the status of the buildings in the sample over the estimation period. As can be seen, 69 of the 132 buildings were classified as historic in 1990. By 1994, a total of 84 of the original 132 were classified as historic; a net increase of 15 buildings since 1990.

Exhibit 2 provides a statistical summary of the historic buildings and the control group of non-historic buildings in the sample as of 1994. A comparison of the mean values for the two groups reveals what one might expect; the historic buildings are older, smaller in total square footage, and have smaller average floor plates. As well, on average, the historic buildings have fewer stories, less adjacent parking, and more metered street parking and are farther to non-street parking than their non-historic counterparts. Finally, the historic buildings had lower assessed values on average and are closer to other historic buildings than the non-historic group of buildings.

Exhibit 2 | Summary Statistics: Independent Variables (Based on 1994 data)

	Mean	Minimum	Maximum	Median	Std. Dev.
Historic					
Age (years) (*AGE*)	91.3	64	113	91	11.1
Total Square Feet (*SF*)	46,656	2,185	269,608	34,787	48,518.2
Average Floor Plate (sq. ft.) (*AF*)	7,241	986	33,397	5,932	5,608.5
Expenditure on Property (1991–1994) Building Permits (*P*)	80,069	0	844,000	1,000	173,359.9
Distance to Nearest Historic Building (in population) meters (*DistHP*)	33.3	1	350	5	70.3
Distance to Public Parking (non-street) meters (*DP*)	23.3	1	120	10	29.6
Number of Stories (*ST*)	5.9	1	15	5	2.8
Properties with Parking (adjacent) (*PA*)	29.5%				
Properties with metered street parking (*NP*)	97.1%				
Number of Historic Buildings (in sample)	71				
Non-Historic					
Age (years) (*AG*)	61.2	8	111	77	30.7
Total Square Feet (*SF*)	91,788	1,360	719,380	44,766	122,474.8
Average Floor Plate (sq. ft.) (*AF*)	14,130	820	86,656	8,154	16,741.5
Expenditure on Property (1991–1994)-Building Permits (*P*)	111,522	0	2,754,000	0	367,275.9
Distance to Nearest Historic Building (in sample) meters (*DistHP*)	122.7	1	800	70	151.9
Distance to Public Parking (non-street) meters (*DP*)	23	1	135	15	29.4
Number of Stories (*ST*)	6.1	1	28	5	5.1
Properties with Parking (adjacent) (*PA*)	50.8%				
Properties with metered street parking (*NP*)	81.9%				
Number of Non-Historic Buildings (in sample)	61				

The Determinants of the Market Value Assessments

A Hedonic Model of Assessed Values

A hedonic pricing model is used to determine the effect of the explanatory variables in Exhibit 2 on the assessed values, which is the standard approach to estimating the effect of building characteristics on building values. A number of functional forms for the hedonic model were considered (e.g., linear, semi-log, and double logarithmic), but the double logarithmic model was selected for use.[33]

The general formulation of the model is the following: ln (Assessed Value) = constant + $\alpha_i \ln x_{i,\,t-1} + \beta_i D_{i,\,t-1}$, where $i = 1 \ldots n$ and x_i are the continuous independent variables and D_i includes a number of dummy variables, which capture the effect of historic designation and parking availability.

Specifically, the following model was estimated:

$$\begin{aligned}\ln(A_t) = \text{constant} &+ b_1 \ln(AGE_{t-1}) + b_2 \ln(AF_{t-1}) \\ &+ b_3 \ln(SF_{t-1}) + b_4 \ln(DistHP_{t-1}) \\ &+ b_5 [\ln(DistHP_{t-1})]^2 + b_6 \ln(DP_{t-1}) \\ &+ b_7 DGII_{t-1} + b_8 DGIII_{t-1} \\ &+ b_9 NP_{t-1} + b_{10} PA_{t-1} + 0. \qquad (1)\end{aligned}$$

The dependent variable is the ln of the assessed value of the building (*A*). Assessed value is used rather than assessed value per square foot for a number of reasons. First, given that the rental values for buildings in general vary by floor, it was felt that using an average assessed value per square foot measure as a dependent variable was inappropriate.[34] Second, hedonic models of house prices are generally expressed in terms of total values.[35] The independent variables include the age of building (*AGE*), average floor plate (*AF*), the size of building as measured by total square feet (*SF*), distance from the nearest historic building (*DistHP*), which includes a nonlinear term ($DistHP^2$), and distance from parking (*DP*) all expressed in natural log form, while *NP* and *PA* are measures of parking availability (see Appendix A for definitions).[36] In addition, dummy variables for the designation of the historic building, Grade II or Grade III, have been included.[37] Reflecting the nature of the assessment procedure, the independent variables are lagged one period, meaning that the assessed value for 1998 is based on the building characteristics for 1995, the 1994 values are based on 1990 building characteristics, and the 1990 values are based on 1987 building characteristics.

Estimation Procedure

The hedonic model of assessed values was estimated using four different estimators, with the results reported in Exhibit 3. The first estimator was the standard OLS estimator, while the second and third are two Robust estimators: the Robust (Unclustered) and the Robust (Cluster) estimator. The three estimators yield the same coefficient estimates, but produce different standard errors for the coefficient estimates. The difference between the estimators is described as follows.[38] Assume the regression model in Equation (1) can be written as:

$$y_{it} = \beta x_{it} + \epsilon_{it}, \quad \epsilon_{it} \sim N(0, \sigma^2). \tag{2}$$

The above estimators make different assumptions about the distribution of the error term. OLS assumes that the (x_i, ϵ_i) are independently and identically distributed (i.i.d.) with variance, σ^2. The two robust estimators address the question of how to make valid statistical inferences about the coefficient estimates when the (i.i.d.) condition does not hold. The Robust (Unclustered) estimator weakens the assumption that the error term is identically distributed. This allows the use of the robust standard errors to make valid statistical inference about the population parameters. The Robust (Clustered) relaxes the assumption of the independence of observations, and produces the ''correct'' standard errors even if the observations are correlated. The Robust (Cluster) estimator is based on the fact that there are two clusters of buildings in the sample: historic and non-historic designated buildings.

The fourth estimator is the Random Effects estimator. While panel data estimation is becoming commonplace, it is important to highlight a number of issues related to the estimators used in panel data.[39] The Ordinary Least Squares (OLS) estimator treats the data as a simple cross-section time-series model, ignoring the fact that the time series reflect changes to the same cross-sectional units over time. Applied to a panel data set, Equation (2) requires one to specify the nature of the error term, $\epsilon_{it} \equiv c_i + u_{it}$, $t = 1, \ldots T$. which can be termed a composite error term.[40] As outlined by Wooldridge (2002), ϵ_{it} is the sum of the unobserved effect and an idiosyncratic error. The unobserved effect c is the unobservable time constant characteristic of the building.

The Random Effects estimator uses *quasi-demeaned* data; it subtracts a fraction of that time average.[41] The key issue is whether the fixed or unobserved effect is correlated with the other regressors. If the unobserved effect is uncorrelated with each explanatory variable, then the Random Effects will yield more efficient estimates then using OLS.[42] Random effects estimation requires estimates of the variances of the components of the composite error term, that is $\sigma_\epsilon^2 = \sigma_c^2 + \sigma_u$. The Random Effects estimator subtracts θ, which is function of σ_c^2 and σ_u^2 from

Exhibit 3 | Regression Results

	OLS	Cluster	Robust	Random Effects
	(1)	(2)	(3)	(4)
Age [ln(AGE_{t-1})]	−.7239*	−.7239*	−.7239*	−.6338*
	(.0621)	(.0219)	(.0572)	(.0874)
Average Floor Plate [ln(AF_{t-1})]	.0588	.0588*	.0588*	.0053
	(.0860)	(.0113)	(.0823)	(.1269)
Number of Square Feet [ln(SF_{t-1})]	.7922*	.7922*	.7922*	.8489*
	(.0646)	(.0159)	(.0548)	(.0981)
Grade 2 [*DGII* (−1)]	.2644*	.2644*	.2644*	.1612
	(.0992)	(.0853)	(.1119)	(.1360)
Grade 3 [*DGIII* (−1)]	−.1239	−.1239	−.1239	−.0823
	(.0942)	(.0678)	(.0951)	(.1146)
Distance to Historic Building [ln($DistHP_{t-1}$)]	.1557*	.1557*	.1557*	.1288
	(.0564)	(.0402)	(.0577)	(.0851)
[ln($DistHP_{t-1}$)]^2	−.0120	−.0120	−.0120	−.0074
	(.0103)	(.0010)	(.0107)	(.0157)
Access to Parking (NP_{t-1})	.4395*	.4395*	.4395*	.3969*
	(.1334)	(.0404)	(.1322)	(.2073)
Parking (adjacent) (PA_{t-1})	.3537*	.3537*	.3537*	.3706*
	(.0792)	(.1733)	(.0740)	(.1230)
Distance to Public Parking [ln(DP_{t-1})]	−.0132	−.0132	−.0132	−.0098
	(.0225)	(.0203)	(.0234)	(.0349)
D98	−.2195*	−.2195*	−.2195*	−.2342*
	(.0801)	(.0107)	(.0800)	(.0510)
D94	−.0164	−.0164	−.0164	−.0243
	(.0797)	(.0330)	(.0767)	(.0497)
Constant	6.6984*	6.6984*	6.6984*	6.2646*
	(.5113)	(.3878)	(.5305)	(.7515)
θ				.6043
R^2	.8104	.8104	.8104	.8082

Notes: The dependent variable is ln(Assessed Value) − ln (*A*). Standard errors are in parentheses. The number of observations is 396.

* Significant at the 5% level (*p*-values less than .05).

** Significant at the 10% level (*p*-values less than .1).

the dependent and independent variables, leaving a regression on quasi-demeaned data. To summarize, the Random Effects approach exploits the serial correlation in the composite error using a Generalized Least Squares (GLS) framework.

Estimation Results: Hedonic Model

The OLS and the two Robust estimators yields similar results: the assessed value of the building is positively related to size of building (as measured by square feet) and access to parking, both parking adjacent to the building (*PA*) and metered street parking (*NP*) for all estimators. Similarly, the assessed value is inversely related to the age of the building.

In terms of the marginal effects, the economic depreciation rate for the buildings in the sample is estimated to be approximated 1% of the mean value of buildings ($1,804,491).[43] Similarly, an additional square foot (based on a mean value of 67,350.7 square feet) raises the assessed value of a building by about $21.00. In addition, for each additional meter that a building is located away from a historic building (based on a mean distance of 84.9 meters), its assessed value increases by $3,300.[44] This suggests that being located some distance from the nearest historic building results in higher assessed values, which provides some evidence that the assessment of market values incorporates a negative pecuniary externality from being located close to a historic building. Regarding the impact of historic buildings, those buildings designated Grade II have higher assessed values for the OLS, Robust, and Cluster estimators.

The results for the Random Effects estimator differ somewhat from the OLS and Robust estimators. As pointed out by Wooldridge (2003:471), if $\theta = 0$, the random effects results collapse to the OLS results, while if $\theta = 1$, the fixed effect results are obtained. For the data set used here, the estimate of θ is .60425, which means that the random effects results are quite far from the OLS results. This means that the unobserved effect is relatively important here, which accounts for the differences in the parameter estimates in this case.

Sample Selection Model

Whenever data is drawn from a population, the issue of sample selection bias arises. For the data set here, the sample was drawn from a set of historic and non-historic buildings. In this section, a sample selection model introduced by Heckman (1976) is estimated, which is the recommended approach for dealing with sample selection issues. Of concern for the present study is whether the decision to renovate is endogenous. The Heckman (1976) model applied here involves a two-stage estimation. The first stage involves a probit model that determines the probability of renovation (p_d). The appropriate controls (**w**) are introduced, which are thought to influence that decision. Then, based on the first

stage results, a second stage estimation takes place, which regresses the *change* in assessment (*dA*) on a set of building characteristics, as well as the expenditure on renovation for the respective buildings.

Specifically, Heckman's (1979) two-step estimation is described as follows.[45] Let the probit equation $z_i^* = \mathbf{w}'(\gamma_i + u_i)$ be the equation that determines the sample selection.

Step 1. Estimate the probit equation using maximum likelihood to obtain estimates of γ. For each observation in the selected sample, compute an estimate of $\lambda_i^* = \phi(\mathbf{w}_i' \gamma_i)/\Phi(\mathbf{w}_i' \gamma_i)$ and an estimate of $\delta_i^* = \lambda_i^* (\lambda_i^* - \mathbf{w}_i' \gamma^*)$.

Step 2. Estimate the parameters of the regression model β and $\beta_\lambda = \rho \sigma_\epsilon$ by least squares of *da* on **x** and the estimate of λ^*.

Intuitively, the procedure involves using all *N* observations for the probit selection equation, which yields an estimate of the inverse Mills ratio. The inverse Mills ratio is then used as a regressor on the selected sample, N_1, which yields consistent estimates of the β, the parameters of the structural model, $y_i = x_i \beta + \epsilon_i$.

Given the above, testing for the existence of sample selection is a simple test of the significance of the coefficient of the estimated inverse Mills ratio. (Wooldridge, 2002:564).

The Rehabilitation Decision (Data)

In order to gain some insight into this rehabilitation decision, Exhibit 4 provides summary statistics for the set of buildings, both historic and non-historic that were rehabilitated. The first column for each category indicates the mean value for the rehabilitated buildings by building type; the second column reflects the corresponding value for the set of buildings that were not rehabilitated.

Overall, 64 out of the 132 buildings had been rehabilitated in the three-year period prior to 1994, with an average expenditure of ($195,000). Overall, the buildings that were rehabilitated tended to be considerably larger—in terms of square footage, average floor plate, and higher in terms of assessed value and number of stories—than their non-rehabilitated counterparts. In addition, the rehabilitated buildings tended to be younger.

As far as the historic buildings in the sample are concerned, 37 of the 71 buildings had been rehabilitated in the three-year period prior to 1994. The historic buildings that were rehabilitated tended to have much larger assessed values ($1.23 million versus $490,000), were larger in size (56,000 sq. ft. versus 36,000 sq. ft.) and had larger average floor plates (8,300 sq. ft. versus 6,000 sq. ft.) than the sample of historic buildings as a whole.

Of note is the fact that the rehabilitated historic buildings were of a similar age to their non-rehabilitated counterparts. The historic buildings that were

Exhibit 4 | Characteristics of Rehabilitated Buildings 1994

	All Buildings		Historic		Control	
	Rehabilitated	Not	Rehabilitated	Not	Rehabilitated	Not
Number	64	68	37	34	27	34
Permit Values (*P*)	195,121	0	153,645	0	251,959	0
Assessed Value (*A*)	2,805,394	1,080,794	1,231,634	490,310	4,962,027	1,671,279
Square Foot (*SF*)	92,271	44,211	56,300	36,160	141,564	52,261
Average Floor Plate (*AF*)	12,281	8,678	8,361	6,022	17,653	11,333
Stories (*ST*)	6.8	5.2	6.0	5.7	7.9	4.7
Age (*AG*)	74.7	79.9	90.5	92.2	53.1	67.6
Dummy Variable (*DHB*) (1=Historic, 0=Control)	0.57	0.5	1.0	1	0	0
Parking Adjacent (*PA*) (1=Yes, 0=No)	0.35	0.42	0.24	0.35	0.51	0.5
Distance to Public Parking (*DP*) meters	15.3	30.9	15.4	31.8	15.1	30
Distance to Nearest Historic Building (*DistHP*) meters	83.2	85.8	27.5	39.6	159	132
Access to Metered Street Parking (*NP*)	0.93	0.86	1.0	0.94	0.85	0.79

Note: Values in the table are means.

rehabilitated tended to be closer to parking, as well as closer to other historic buildings than their non-rehabilitated counterparts.

As far as the sample of non-historic buildings is concerned, 27 out of the 61 control buildings had been rehabilitated in the three-year period prior to 1994. The control buildings that were rehabilitated tended to share the same features in relation to their non-rehabilitated counterparts as for the set of historic buildings.

First Stage: Probability of Renovation (Model)

In order to determine the probability that a building would be renovated, a number of regressors (for **w**) have been used: a set of building characteristics (square feet, average floor plate, age of building), a number of measures of parking availability (parking on site, distance to parking, on street parking), and building type (historic designation). The regressors for the probit model have not been lagged based on the idea that the renovation decision should incorporate the current characteristics of the buildings.[46]

Exhibit 5 lists the results from the probit model, with the building coded $pd=1$ if the building had a building permit (and renovations) taken out in the period since the last assessment. While the estimates and standard errors of the coefficients differ somewhat depending on the estimator used for the selection model (Two-step, Robust, or Cluster), the results are quite similar. Larger buildings, buildings with smaller average floor plates, and younger buildings were more likely to have undergone some renovation in the previous period. In addition, Grade 1 and Grade 2 buildings were more likely to be renovated than buildings designated Grade 3 or buildings that are non-historic. Buildings that were farther from parking were less likely to be renovated, as were buildings with on-site parking. The variable distance to nearest historic building (or its square) was not statistically significant.

While not surprising, these results should be placed in context. The measure of the rehabilitation decision only captures renovation expenditures between the assessment periods. A building may not have had any rehabilitation expenditures in a period for a number of reasons. First, some of these buildings may have had extensive renovations in periods prior to the sample period. Second, it may be the case that no renovation expenditures were needed. Third, it could have been the case that the owner had decided to move capital out of the building, which means that no maintenance expenditures were undertaken.

Second Stage: Effect of Renovation Expenditures on the Change in Assessment

The results for the second stage of the sample selection estimation are listed in Exhibit 6.[47] This stage determines the effect of a number of factors, including expenditures on renovation and the *change* in the assessed value of buildings.

Exhibit 5 | Probit Selection Regression

	Probit (Two-Step)	Probit (Robust)	Probit (Cluster Estimation)
	(1)	(2)	(3)
Age (*AGE*)	−.0068*	−.0074*	−.0074
	(.0032)	(.0034)	(.0051)
Average Floor Plate (*AF*)	−.00002*	−.00003*	−.00003*
	(9.49e-06)	(9.30e-06)	(1.72e-06)
Number of Square Feet (*SF*)	4.49e-06*	6.05e-06*	6.05e-06*
	(1.26e-06)	(1.85e-06)	(2.25e-06)
Grade 2 (*DGII*)	.3187**	.3057**	.3057*
	(.1952)	(.1774)	(.1323)
Grade 3 (*DGIII*)	.2661	.2318	.2318
	(.1909)	(.1636)	(.1530)
Parking (adjacent) (*PA*)	−.2485**	−.2380**	−.2380**
	(.1521)	(.1473)	(.1712)
Access to Metered Street Parking (*NP*)	−.1673	−.2473	−.2473
	(.2627)	(.2624)	(.2125)
Distance to Public Parking (*DP*)	−.0063*	−.0060*	−.0060*
	(.0024)	(.0024)	(.0020)
D98	−.1593	−.1144	−.1144
	(.1608)	(.1656)	(.1026)
D94	.1653	.1821	.1821*
	(.1594)	(.1522)	(.0236)
Constant	.4739	.5178	.2753
	(.3571)	(.3928)	(.4851)

Notes: The dependent variable is Renovation Decision (*pd*). Standard errors are in parentheses. The number of observations is 396. The number of censored observations is 227. The number of uncensored observations is 169. For the probit (two-step), Wald Chi Sq. (15) = 45.91 and Prob > Chi Sq. 0.0000. For the probit (robust), Wald Chi Sq. (13) = 33.99 and Prob > Chi Sq. 0.0012. For the probit (cluster estimation), Log Likelihood = −2,929.774.
* Significant at the 5% level (*p*-values less than .05).
** Significant at the 10% level (*p*-values less than .1).

While the three estimators yield fairly similar results, the estimator that yielded the greatest number of significant explanatory variables was the Heckman (Cluster) estimator. Of particular interest is the effect of expenditure on rehabilitation on the *change* in assessed value of buildings. The estimate is .326 for the Heckman (Cluster) estimator, or in other words, a $1 expenditure on rehabilitation leads to an approximately $0.33 increase in assessed value.

Exhibit 6 | Second Stage Regression

	Heckman (Two-Step)	Heckman (Robust)	Heckman (Cluster Estimation)
	(1)	(2)	(3)
Age [*AGE*(−1)]	−14,982	−15,754	−15,754**
	(14,733.3)	(10,948.2)	(9,835.4)
Average Floor Plate [AF(−1)]	107.7824*	94.4853*	94.4853*
	(58.0422)	(41.4507)	(23.1559)
Number of Square Feet [*SF* (−1)]	−15.7408	−12.0760*	−12.0760*
	(10.2173)	(5.0947)	(4.1976)
Expenditure on Rehabilitation [*P*(−1)]	0.3284*	0.3264**	0.3264*
	(0.1300)	(0.1746)	(0.1522)
Grade 2 [*DGII* (−1)]	798,015	818,540**	818,540*
	(729,716)	(522,776)	(428,576)
Grade 3 [*DGIII* (−1)]	776,829	843,834*	843,834*
	(624,275)	(401,341)	(286,823)
Distance to Historic Building [*DistHP*(−1)]	−1,165.589	−1,360.303	−1,360.303
	(2,846.68)	(4,082.75)	(1,426.40)
[*DistHP*(−1)]^2	1.3904	1.2588	1.2588*
	(4.0300)	(3.6947)	(0.7593)
Access to Metered Street Parking [*NP*(-1)]	−329,737	−666,380	−666,380
	(879,196)	(1,122,696)	(682,687)
Parking (adjacent) [*PA*(−1)]	599,480	519,047	519,047*
	(669,045)	(406,286)	(112,191)
Distance to Public Parking [*DP*(−1)]	10,151.3	7,686.6	7,686.6*
	(16,346.76)	(6,264.57)	(252.09)
D98	−1,445,551*	−1,488,024*	−1,488,024*
	(603,761)	(462,700)	(665,463)
D94	−1,782,107*	−1,758,804*	−1,758,804*
	(538,561)	(416,730)	(492,591)
Constant	3,955,035*	3,785,199*	3,785,199*
	(1,961,530)	(1,865,532)	(628,386)
Mills (Lambda)	−2,517,030	−2,021,290*	−2,021,290*
	(3,314,835)	(445,786.5)	(374,810)

Notes: The dependent variable is Change in Assessed Value (*dA*). Standard errors are in parentheses. The number of observations is 396. The number of censored observations is 227. The number of uncensored observations is 169. For Heckman (Two-Step), Wald Chi Sq. (15) = 45.91 and Prob > Chi Sq. = 0.0000. For Heckman (Robust), Chi Sq. (13) = 33.99 and Prob > Chi Sq. = 0.00120. For Heckman (Cluster Estimation), the Log Likelihood = −2,929.774.
* Significant at the 5% level (*p*-values less than .05).
** Significant at the 10% level (*p*-values less than .1).

A number of comments can be made to explain what may be considered a relatively low effect of rehabilitation expenditures on the assessed value of buildings found in the models.[48] First, the historic buildings in the sample are of a commercial nature.[49] As such, the assessed value is based on an income approach to market value, which is based on net rent per leaseable square foot. While the building may be upgraded structurally and cosmetically, if there isn't a substantial increase in rental area of the existing structure, then the increase in assessment, if any, will only reflect the improved quality of the space. Additionally, many of the restoration projects result in diminished leaseable space. This is due to ''modern'' fire, mechanical, and building code requirements.[50]

Second, it is important to realize that using the income approach to assessment requires that the appraisal value be based on the building as it currently exists using historic data. However, officials with the Assessment Department of the City of Winnipeg point out that in undertaking the assessment of these buildings, they relate the physical condition of a building to its revenue generating capability and level of expenses. A building in poor repair will attract lower rents per square foot and have higher maintenance and operating expenses (heating, hydro, etc.). If renovations occur that change the physical condition rating of the property during or after the reference year, then the rent attributed to the property will be adjusted to reflect the new condition rating as will the expense level. That is, the assessed value of the building will only increase to the extent that the renovations are thought to increase the net operating income from the building.

In addition, officials with the Assessment Department state they never take the actual capital costs or a portion thereof to develop a specific assessment. It is their belief that not all capital costs will have a direct or immediate effect on the gross revenue and thereby the value of the real estate. They find in many instances what are listed as capital costs for income tax purposes are non-assessable items and therefore not allowed as a deduction for assessment purposes.

A number of additional results are of interest. For example, buildings designated historic, either Grade 2 or Grade 3, have higher assessed values when compared to their non-historic counterparts. In addition, a test was conducted to evaluate whether there was a relationship between the change in assessed value and the distance to the nearest historic building in the area (*DistHP*).[51] A nonlinear relationship was tested, and for Heckman Cluster, the estimated relationship was: Assessed Value $= -1360.303\ DistHP + 1.25878\ DistHP^2$; however, the first regressor was not statistically significant. The estimated relationship suggests that the change in assessed values increases with a building's distance from the nearest historic building, suggesting a negative pecuniary externality from being located close to a historic building. It has been suggested that one possible explanation for this observed neighborhood effect is that the area close to the historic district is extremely marginal. For the area surrounding the district from which the sample is drawn, this is in fact the case.[52] The depressed condition of the surrounding area has been a longstanding problem for the City of Winnipeg.

Conclusion

Using a number of estimators, the findings indicate that controlling for a number of key characteristics of buildings, the assessed value of a building is higher for some classes of historic buildings. There is also some evidence of a neighborhood effect, in that the assessed value of the building is higher the farther it is located from the nearest historic building. As might be expected, the presence of parking has a large, positive effect on the assessed values of the buildings in the area.

In addition, a two-stage Heckman sample selection model was estimated to determine the factors that influence the rehabilitation decision, and the effect of those expenditures and other building characteristics on the change in assessed values of buildings.

Regarding the factors that influence the rehabilitation decision, the historic buildings as a group were more likely to have had some renovation in the period prior to the general assessments. One possible explanation for this result is that historic designation, in limiting the ability of owners to alter or demolish the building, forces building owners to rehabilitate their respective buildings. In addition the buildings that were more likely to be rehabilitated tended to have much larger assessed values, were larger in size, closer to parking, and had smaller average floor plates than the entire group of buildings. This suggests that the type of buildings that are more likely to need fiscal support may be smaller buildings with larger average floor plates.

The findings also reveal that the expenditures on renovations contribute significantly to the change in assessed values of buildings, although less than might be expected. For instance, the marginal effect of rehabilitation expenditures on assessed value was approximately $0.33 for each dollar of expenditure. Related to this result is the observation that in changing the use of the building, there is often a significant discount that occurs in the assessed values, since to change the use of the building requires substantial upfront renovation costs. Thus, if renovation and the change in the type of use of building status are occurring simultaneously, then the overall effect on the assessed value is capturing both of these effects.

Given that the majority of the buildings in the area are second-generation industrial buildings, it is useful to drawn upon the work of Lipscomb (2002) who has addressed the issue of the assessment of second-generation industrial buildings, particularly warehouses. Lipscomb observes that in many areas of the U.S., the supply of specialized industrial buildings has increased without a corresponding increase in demand for compatible industrial users. He observes in determining suitability for alternative or ‘‘second generation’’ use, the appraiser’s investigation must include the functional utility of the subject and the feasibility of conversion to an alternative use. In particular, Lipscomb (2002:298) observes that ‘‘when the market has an over supply with falling rental rates for new space, then feasibility for modifying an existing industrial facility is limited and translates into higher

risk and lower value." Lipscomb outlines a number of factors for appraisers to consider in appraising second-generation industrial buildings.[53] Thus, it might be observed that the results of this study provide some evidence of the greater risk and limited return from rehabilitation of second-generation buildings without government fiscal incentives.

While it is possible that the market value assessments of the properties in the sample may have been consistent, it is not known whether they have been efficient in terms of variation from the true market values. In order to test whether the model used here is a useful predictor of building market values, data must be collected on actual selling prices of buildings in the sample. Once the tax credit program has been in place for the required length of time, the accuracy of the above empirical model as a predictor of market value assessment and rehabilitation activity can be evaluated. That is, once a sufficient number of these buildings are sold, the accuracy of these market value assessments can be determined. In the meantime, it is hoped the results obtained in this study can be useful to policymakers who are concerned about the rehabilitation of historic buildings in their areas.

Appendix A

Description of Data

Variable	Source(s)	Comments
Assessed Values	Assessment Department City of Winnipeg	Data was collected for each city-wide assessment year (1990, 1994, and 1998). All figures reflect post-appeal amounts.
Building Permits	Permits Department, City of Winnipeg	Data has been aggregated to correspond with each assessment year. For example, building permit data for 1990 permits issued during 1987, 1988, 1989. Permits taken out for signs have been excluded (non-structural expenditures), as have those permits that amount to less than $1,000.
Age	Office of the Heritage Planner, City of Winnipeg	For the purposes of this study, the variable is defined as the age of the building as of 1998. Later additions to existing structures have not been considered.
Total Square Feet	Office of the Heritage Planner, City of Winnipeg	
Average Floor Plate	Office of the Heritage Planner, City of Winnipeg	This variable is defined as Total Square Footage divided by the number of stories.

Appendix A (continued)

Description of Data

Variable	Source(s)	Comments
Number of Stories	Office of the Heritage Planner, City of Winnipeg	
Distance to Nearest Historic Building (in sample)	Land Information Services (GIS), Property & Development Services Dept., City of Winnipeg	All distances have been calculated on the basis of five-meter increments (rounded up or down from the midpoint).
Distance to Public Parking (non-street)	Land Information Services (GIS), Property & Development Services Dept., City of Winnipeg	All distances have been calculated on the basis of five-meter increments (rounded up or down from the midpoint).
Properties with Parking	Land Information Services (GIS), Property & Development Services Dept., City of Winnipeg	
Properties with Metered Street Parking	Institute Urban Studies Site Survey	

Appendix B

Exhibit B1
Regression Results

	OLS	Cluster	Robust	Random Effects
	(1)	(2)	(3)	(4)
Age *AGE*(−1)	−45,710*	−45,710*	−45,710*	−46,269*
	(4,352)	(12,981)	(7,495)	(6,358)
Average Floor Plate [*AF*(−1)]	−58.2101*	−58.2101*	−58.2101*	−57.5445*
	(12.7084)	(12.7020)	(25.1512)	(18.5510)
Number of Square Feet [*SF* (−1)]	30.8259*	30.8259*	30.8259*	30.8211*
	(1.7919)	(1.8034)	(3.4740)	(2.6571)
Grade 2 [*DGII* (−1)]	263,473	263,473*	263,473	276,398
	(272,454)	(115,120)	(231,900)	(369,620)
Grade 3 [*DGIII* (−1)]	74,828	74,828	74,828	174,769
	(260,348)	(215,946)	(180,189)	(320,665)
Distance to Historic Building [*DHP*(−1)]	−2,809	−2,809	−2,809	−2,795
	(1,791)	(2,120)	(2,429)	(2,651)
$[DHP(-1)]^2$	1.1104	1.1104	1.1104	1.1239
	(2.4609)	(2.5537)	(2.0705)	(3.6592)
Access to Parking [*NP*(−1)]	−63,259	−63,259	−63,259	−72,710
	(388,138)	(40,739)	(609,996)	(579,258)
Parking [*PA*(−1)]	444,928*	444,928	444,928*	439,345
	(218,373)	(412,280)	(209,080)	(326,077)

Appendix B (continued)

Exhibit B1
Regression Results

	OLS	Cluster	Robust	Random Effects
	(1)	(2)	(3)	(4)
Distance to Park [*DP*(−1)]	525.3636	525.3636	525.3636	495.745
	(3,430)	(4,572)	(2,421)	(5,117)
D98	−387,100**	−387,099.5	−387,100**	−389,568*
	(226,011)	(280,939)	(221,727)	(151,354)
D94	−49,649	−49,649*	−49,649	−53,488
	(224,734)	(10,561)	(225,387)	(146,906)
Constant	3,849,284*	3,849,284*	3,849,284*	3,865,113*
	(544,226)	(1,400,454)	(1,127,799)	(793,272)
R^2	0.7213	0.7213	0.7213	0.7211

Notes: The dependent variable is Assessed Value (*A*). Standard errors are in parentheses. The number of observations is 396.
* Significant at the 5% level (*p*-values less than .05).
** Significant at the 10% level (*p*-values less than .1).

Endnotes

[1] See, for example, Beaumont (1996) for a discussion of historic preservation issues and policies used in the United States and Clayton Research Associates (1995) for a corresponding discussion of Canadian cases.

[2] See City of Winnipeg (1992).

[3] Related research includes Li and Brown (1980) who estimate the influence of a number of micro-neighborhood factors on housing prices. These factors include visual quality, noise pollution, and proximity to industries, thruways, and commercial establishments. They find that proximity to certain non-residential land uses affects housing prices by having a positive value for accessibility and a negative value for external diseconomies. In a more general framework, Quigley and Rubinfeld (1989) exploit the nonlinear hedonic prices observed in the housing market to estimate the parameters of a simple model of home production and utility maximization. Apart from the above, there is a sizeable literature on hedonic regressions in general, as well as a number of papers, which examine the appropriate functional form for the hedonic model (e.g., Milon, Gressel, and Mulkey, 1984; Follain and Jimenez, 1985; and Burgess and Harmon, 1991).

[4] See also Asabere and Huffman (1991) for evidence that the net effect of historic districting on land values is positive. In addition, Asabere and Huffman (1994b) find location in a federally certified historic district has a significant increase on the sales price for a sample of owner occupied homes. For references to additional studies based on historic properties, see Coulson and Leichenko (2001).

[5] Asabere and Huffman (1994a:226) report that the Philadelphia program gives the city control over demolition, alteration, construction, and maintenance of city certified structures. See also Asabere and Huffman (1994b) for additional evidence of the adverse effects on sales prices of designated properties from restrictions on property rights.

[6] An extended discussion of the development of downtown Winnipeg can be found in Lyon and Fenton (1984).

[7] The City of Winnipeg is in the process of having the federal government recommend the District to UNESCO (the United Nations Educational, Scientific and Cultural Organization) for consideration as a World Heritage Site.

[8] City of Winnipeg (1992).

[9] The program became City of Winnipeg By-Law 7155/98, passed February 25, 1998. The program came forth following a lengthy review of alternative heritage conservation policies undertaken by an Ad Hoc Committee on Heritage Buildings. This committee was composed of Councilors, administrators of the City, heritage conservation advocacy groups, the architecture profession, the real estate and development sector, and the construction industry.

[10] A fuller description of the data is provided in the Appendices.

[11] The City of Winnipeg Planning Department, Heritage Conservation: Design Approval Procedures, April 1991.

[12] It should be noted that a Certificate of Suitability is not required for ordinary maintenance or repair of a building provided the work does not involve a change in any element of design affecting the appearance of the building or its architectural or historic interest. However, a Certificate of Ordinary maintenance must be obtained.

[13] The City of Winnipeg Planning Department, Heritage Conservation: The Buildings Conservation List, April 1991. Inclusion in the Historical Buildings Inventory carries no

restrictions on property use except to delay the approval of a demolition permit pending an assessment of whether the building in question warrants preservation.

[14] The by-law sets out detailed criteria and processes to guide its administration. These provisions include the criteria for determining a structure's heritage significance, listing procedures, appeal processes, and requirements for obtaining approvals to undertake alterations, repairs, and maintenance. The authority to regulate and prohibit the issuance of demolition permits is outlined, as is the role of City Council in determining whether demolition or removal of a listed structure should be approved.

[15] An anonymous referee has raised the issue of whether the historic designation of the building by owners is endogenous and if so would create a subsequent econometric problem. Specifically, even if the ultimate classification is not decided by the building owners, but the owners are able to influence the designation process, then this suggests that the designation of the building is endogenous. While the process involves the possibility that building owners can apply to have their building designated as historic, the Historical Buildings Committee decides whether the building should be included, that is, whether it has historical significance. The same process is involved should a building owner wish to remove a building from the Building Inventory List or to have its Grade changed. In this case, the owner or the Chief Administrative Officer may apply to the City Clerk to have a structure removed from the Buildings Conservation List, or to have it listed under a different grade. Regarding the question of how effective owners are in getting removed from the list, city officials say it is rare; on average, one building gets delisted every five years. Given that the designation of buildings is initiated by the city, and there have been almost no removals from the list, provides support for the assumption that the classification of buildings is not endogenous.

[16] If demolition is approved, the manner in which the building is dismantled may be regulated. If a demolition application is made for a building not yet listed in the Historical Buildings Inventory, the permit is withheld until the Historical Buildings Committee has had the opportunity to evaluate the structure. The Committee may decide to recommend that the building be designated or ask for the structure to be thoroughly photographed before demolition takes place.

[17] ''Buildings Conservation List,'' the City of Winnipeg Planning Department (1991).

[18] In general, the designation of building as historic is difficult to remove particularly for Grade I and Grade II buildings, which means that owners of those buildings have limited influence over designation.

[19] These represent two distinct funds, restricted to buildings that have been granted historic status. Once granted, building owners may seek support through either of the two programs, but not both. The City of Winnipeg places an annual upper limit on the tax credits it grants, with the Downtown Heritage Building Tax Credit Program being the significantly larger fund.

[20] A map of the area indicating the location of the buildings used in the sample is available from the authors on request.

[21] It should be noted that there is a difference between a historic building and a historic structure, with the latter including cultural and historical landmarks (or monuments).

[22] To date, no structure in this category has received HBTCP assistance.

[23] For consistency of the data set, buildings were excluded that had no income generated (unoccupied), given that the market value assessment used by the City of Winnipeg for the rest of the data set was based on the income approach.

[24] It also included 63 control buildings for a total of 132.

[25] An anonymous referee has raised this issue.

[26] The number was obtained from a map provided by the City of Winnipeg's Land Information System dated November 1, 1998. A current estimate is plus or minus five buildings since some demolition or new construction may have taken place since that time. From the total of 770 buildings downtown, 112 (designated historic buildings) were subtracted to arrive at the figure 658.

[27] Three control buildings are actually located outside the boundary of the area covered by By-Law 4800/88. In the subsequent empirical work, the null hypothesis that the location of these three buildings had no statistically different effect on the mean assessed values in relation to the set of control buildings within the area could not be rejected; therefore, these buildings were included in the sample.

[28] For the 1998 assessment, the prior period is from 1991 to 1994.

[29] Thus, the tax liabilities for 1998 are based on the 1995 reference year, and 1995 tax liabilities are based on the 1990 reference year. This does not mean that the City of Winnipeg believes the assessed values in 1998 are equal to the assessed values in 1995. This is just the lag in the assessment procedure.

[30] There is a precedent for using subjective estimates of real estate prices in empirical work in urban economics. For example, subjective estimates emerging from survey data have been used. DiPasquale and Wheaton (1996:68–69), in illustrating the linear hedonic price technique, refer to data taken from the US. Census Bureau's 1989 American Housing Survey for the Boston Metropolitan area. Plantinga and Miller (2001:60) use Census of Agriculture data, which are per acre county-level averages derived from self-reported estimates by farm operators. Respondents are instructed to report the current market value of land and buildings owned, rented, or leased from others where market value refers to the value the land and buildings would sell for under current market conditions. Coulson and Leichenko (2001:123) use assessment data and argue that while its use is problematic, it was the only data available to them with the necessary range of observations and information on the residential properties. However, given the above, there is a potential source of bias that exists when using assessment data. As suggested by an anonymous referee, there is the potential problem of censoring given the influence of renovation expenditures on values. In addition, the referee points out there's is an ample literature on appraisal smoothing that suggests that there is a real problem with non-residential assessment.

[31] As is well known, any measurement error of the dependent variable is captured in the error term. The key issue is whether the estimates of the dependent variable are biased and/or efficient. There is now a sizable literature on the issue of the accuracy of assessments (e.g., Goolsby, 1997; Graff and Young, 1999; and Hansz and Diaz III, 2001). While the existence and magnitude of the assessment error is still subject to debate, Graff and Young (1997:34) suggest there are good reasons to believe that the average magnitude of random appraisal error is smaller in the case of commercial real estate than for residential housing. For instance, commercial real estate is purchased primarily for cash flow and capital appreciation, suggesting that the hedonic measures institutions apply to value commercial property are more uniform than the corresponding measures for residential housing.

[32] A representative of the City of Winnipeg assessment department reported that, given the uniqueness of the historic and control buildings in the area involved in the study,

individual assessment of the respective buildings is required in order to determine market values.

[33] In the hedonic literature, one finds linear, semi-log, and double log models. Each formulation implies a specific relationship between the regressors and the dependent variable. This study follows Coulson and Bond (1990:439) who use a double log-approach in a hedonic model of residential succession. A Box-Cox regression provided support for the double log model.

[34] Industry officials informed the authors that, in general, rental prices vary by floor.

[35] As reported in Appendix B, when the model was estimated using the Assessed Value per square foot as the dependent variable, the signs and significance of the variables remain largely unchanged, although, as expected the interpretation of the coefficients is changed.

[36] It should be noted that total building size (*SF*) equals the product of average floor plate (*AF*) and number of stories (*ST*).

[37] See The City of Winnipeg Planning Department (1992), p. 2.

[38] The discussion here follows Stata7 User's Guide (2001:254–258). See also Sribney (2001) for a further discussion of the standard errors with the cluster option.

[39] For good overviews of the estimation of panel data models, see Hsiao (1986), Johnston and DiNardo (1997), Pindyck and Rubinfeld (1998), Greene (2000), or Wooldridge (2002).

[40] For a comprehensive discussion of the econometrics of panel data, see Wooldridge (2002).

[41] See Hausman (1978) and Hausman and Taylor (1981) for original sources for specification tests for panel data models. Given that most of the regressors are time invariant, a Fixed Effects estimator was not used.

[42] Moreover, while OLS will produce consistent estimates of the time varying coefficients, their standard errors will be understated. See Johnston and DiNardo (1997) for a further discussion of the properties of the Random Effects estimator. See Wooldridge (2000: 461) for a good discussion of the differences.

[43] That is, as the buildings age one year, the assessed value falls by 0.98%, given the mean age of buildings (73.7 years).

[44] Although the nonlinear term for distance is not significant, the sign of the parameter suggests that building values may not rise monotonically with the distance from the nearest historic building.

[45] See Greene (2003:784).

[46] When lagged regressors were used in the Probit equation, there was little difference in the results, either quantitative or qualitatitive.

[47] As can be seen, the coefficient on the Mills ratio is statistically insignificant for the Heckman (Two Step) estimator but is statistically significant for the Heckman (Robust) and Heckman (Cluster) estimators, which means that in the latter two cases, the null hypothesis of sample selection bias cannot be rejected.

[48] While admittedly low, comparable returns on residential rehabilitation are often in the neighborhood of say $0.5 or $0.8, depending on the type of rehabilitation done.

[49] The following has been described by officials with the City of Winnipeg Heritage Planning Department. It is important to note that this department is independent from the City of Winnipeg Assessment Department.

[50] Most work that is done is interior upgrade to make the buildings viable for new uses. The work includes electrical, mechanical and HVAC upgrades, sprinkler work, elevators and asbestos removal.

[51] As noted by an anonymous referee, a stronger test of the effect of the variable ''distance to the nearest historic building'' requires data on changes in this measure over the time period covered by the sample. The question is whether any of the sample observations were closer to a historic building in 1994 than in 1990. To capture this effect, the distance to the nearest historic building was recalculated to include the effect of any changes in buildings status from non-historic to historic for the two periods. Two separate measures of this variable were calculated for the two assessment years. The first was ''distance to the nearest historic building in the sample''; and the second was the ''distance to the nearest historic building in the area (or population).'' There were no significant differences in the results, so the latter are reported.

[52] The authors thank an anonymous referee for this observation.

[53] McKnight (1999) and Sonneman (2001) outline a number of special issues related to the appraisal of the functional utility of warehouse properties.

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The authors would like to acknowledge the support of the City of Winnipeg and its officials, especially Giles Bugailiskis, in the preparation of this paper. Financial support was also received from the University of Winnipeg Discretionary Grant Program. The authors also wish to thank Xiao-yuan Dong for a number of helpful comments. Excellent research assistance was provided by Tara-Lea Herkert. Anonymous referees provided a number of very helpful comments.

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